REMARKS

Claims 1-27 are pending in the application. Claims 17-22 are allowed. Claims 1-8, 11, 12, 14, 15, 23, and 25-27 are rejected. Claims 9, 10, 13, 16, and 24 are objected to.

In the Office Action, the Examiner rejected claims 1-8 and 26 pursuant to 35 U.S.C. §103(a) as being unpatentable over Poland (U.S. Patent No. 6,080,107) in view of Brock-Fisher et al. (U.S. Patent No. 6,438,258). Claims 1, 11-12, 14-15, 23, 25, and 27 were rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Chandler (U.S. Patent No. 5,860,931). Claims 17-22 were allowed. Claims 9, 10, 13, 16, and 24 were objected to as being dependent on a rejected base claim, but would be allowable if amended.

Claim 12 has been amended.

Applicants respectfully request reconsideration of the rejections of claims 1-8, 11, 12, 14, 15, 23, and 25-27, including independent claims 1, 12, 17, and 23.

Poland in view of Brock-Fisher et al.:

Independent claim 1 recites initiating a contrast agent quantification procedure, repeating initiating the contrast agent quantification procedure during a same imaging session, and automatically normalizing a setting of an ultrasound system as a function of received information for each initiation.

Poland does not disclose repeating initiating the contrast agent quantification procedure. The Examiner notes Poland is directed to "repeated quantization measurements of contrast agent post-baseline and during washout with time during an imaging session." In particular, Poland shows obtaining the successive measurements (e.g., each heart cycle) during the wash-in and/or wash-out periods of the contrast agent (col. 9, line 56-col. 10, line 5). Figures 2-5 show the different measurements for this procedure (col. 10, lines 6-34). There are two possible contrast agent quantification procedures disclosed by Poland, wash-in and wash-out. Poland discloses taking measurements for both wash-in and wash-out, but not repeating either during a same imaging session. For example, Poland adjust the transmit power in conjunction with EKG synchronization to maintain consistency in the measured profile [note the singular "profile"] across a series of cardiac cycles (col. 12, lines 47-51). Poland repeats measurements for a given procedure, but does not repeat initiating of a contrast agent quantification procedure.

Poland changes transmit power to alter concentration, altering the contrast agent (more or less destruction) for a single procedure. Poland provides a same concentration throughout, rather than normalizing initially and repeating for accurate comparison of subsequent procedures.

Brock-Fisher et al. do not disclose contrast agent quantification. Brock-Fisher et al. use tissue response (title, abstract, and col. 1, lines 6-11). Like Poland, Brock-Fisher et al. do not disclose repeating initiating of a contrast agent quantification procedure.

Applicants respectfully submit that a person of ordinary skill in the art would not have used the gain control disclosure of Brock-Fisher et al. to normalize receive gain to perform contrast agent quantification measurements as described by Poland. First, Poland deals with contrast agent imaging (title, and field of invention col. 1, lines 5-10). Conversely, Brock-Fisher et al. deal with tissue response (title, and field of invention col. 1, lines 6-11). Poland and Brock-Fisher et al. teach processes for opposite or different fields. Second, Brock-Fisher et al. rely on set transmit power adjustments to determine the gain (col. 2, lines 39-52). Yet, Poland discloses contrast agent concentration control by varying transmit power based on feedback information (col. 4, lines 6-15). A person of ordinary skill in the art would not have used the set transmit power adjustments to determine gain of Brock-Fisher et al. with the feedback based transmit power modulation to control concentration of Poland. The processes would interfere. Third, Poland relies on measuring received signals for feedback control of the transmit power (col. 4, lines 6-15). Altering the gain as described by Brock-Fisher et al. may interfere with the received signals. The gain differences from adapting gain disclosed by Brock-Fisher et al. would introduce variability of the measurements used by Poland for feedback to set transmit power for contrast agent concentration control. Thus a person of ordinary skill in the art would not have used the receive gain adjustments of Brock-Fisher et al. in the receive signal based feedback of Poland.

Dependent claims 2-11 and 26 depend from independent claim 1, and are thus allowable for at least the same reasons discussed above. Further limitations patentably distinguish the dependent claims from Poland and Brock-Fisher et al. Claim 4 recites adaptively determining a gain. As discussed above, a person of ordinary skill in the art would not have used the gain control of Brock-Fisher et al. with the contrast agent quantification of Poland. Claim 5 recites normalizing at a beginning of each repetition of the contrast agent quantification procedure. Poland normalizes between each measurement based on a time interval to maintain a desired concentration (col. 4, lines 15-24). Normalizing at each scan does not suggest normalizing at a beginning of each

repetition of a contrast agent quantification procedure. Claim 6 recites determining gain separately for each performance of the contrast agent quantification procedure after transmitting destruction acoustic energy and prior to detecting contrast agents. Poland do not show determining gain. Brock-Fisher et al. adapt the gain for each tissue sample or an average of samples (col. 4, lines 13-19; and col. 4, line 62-col. 5, line 7), but do not teach contrast agent detection or gain adjustment separately for different quantification procedures before detection. Claim 8 recites preventing user adjustment for a time period after initiation of the contrast agent quantification procedure. Poland does not disclose this limitation. Claim 26 recites applying a gain to a baseline and subsequent frame of data. Both Poland and Brock-Fisher et al. adapt on a frame-by-frame basis.

Chandler:

Independent claim 1 recites initiating a contrast agent quantification procedure, repeating initiating the contrast agent quantification procedure during a same imaging session, and automatically normalizing a setting of an ultrasound system as a function of received information for each initiation.

Chandler discloses a contrast agent quantification procedure (Figure 2; and col. 2, lines 48-62). Equilibrium concentration of contrast agents is provided by a pump during the study (col. 3, lines 5-12). This equilibrium may prevent measuring changes in concentration and may avoid a need to repeat normalization. There is no disclosure of repeating initiating the contrast agent quantification procedure during a same imaging session.

Dependent claim 11 depends on independent claim 1, and is thus allowable for at least the same reasons. Further limitations of claim 11 patentably distinguish over Chandler. Claim 11 recites adaptively varying gain based on data for one sub-region and free of data from a second sub-region associated with contrast agents. Chandler varies transmit gain to establish a region of contrast agent destruction (col. 6, lines 9-14). The transmit gain is varied until two regions match (col. 6, lines 14-28). For automated gain variation, the system integrates backscatter over the two regions (col. 6, lines 19-22). Chandler uses data from both regions to align the regions, and so does not adaptively vary gain based on data from one sub-region and not data from another sub-region.

Independent claim 12 recites destroying contrast agent in a region of interest, automatically setting a gain parameter for receive signals from the region of interest in response to destroying contrast agents, and detecting contrast agent in the region of interest after.

Chandler varies the transmit gain to align regions for contrast agent destruction (col. 6, lines 9-25). The variation of the transmit gain occurs as part of the destruction of contrast agents to reduce concentration (col. 4, lines 5-19). Chandler sets the transmit gain to adjust the location of destruction, and so does not automatically set a gain parameter for receive signals from the region of interest.

Dependent claims 13-16 and 27 depend from independent claim 12, and are thus allowable for at least the same reasons.

Independent claim 23 recites transmitting acoustic energy to destroy contrast agents, acquiring first data representing a region after transmitting to destroy, and adaptively varying a gain of an ultrasound system based on the first data representing a first sub-region of the region and free of the first data representing a second sub-region of the region, the second sub-region associated with contrast agents. As discussed above for claim 11, Chandler does not disclose these limitations.

Dependent claims 24 and 25 depend from independent claim 23, and are thus allowable for at least the same reasons discussed above.

CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 943-7350 or Craig Summerfield at (312) 321-4726.

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